



Wind Tunnel Tests on Ice Accretion on Wind Turbine Blades

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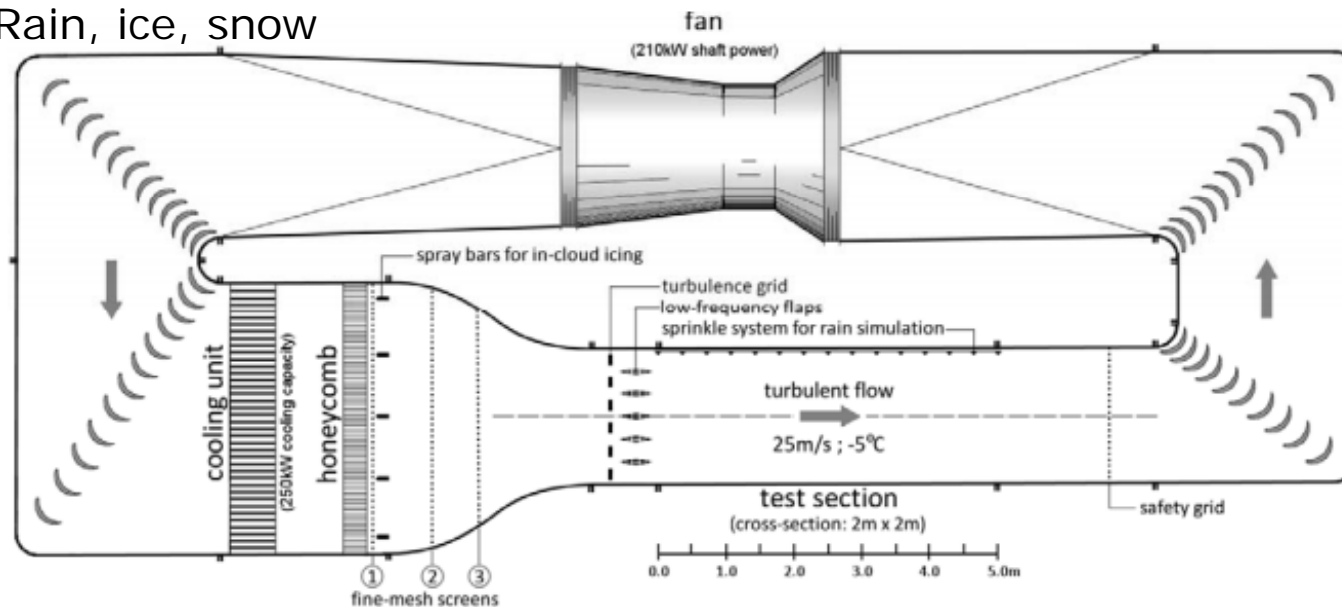
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Purpose

- Study the ice build-up
- Study the effect of ice on the aerodynamics
- Study the flow around the iced blade – flow visualization
- Compare results with numerical programs and other studies

Wind Tunnel

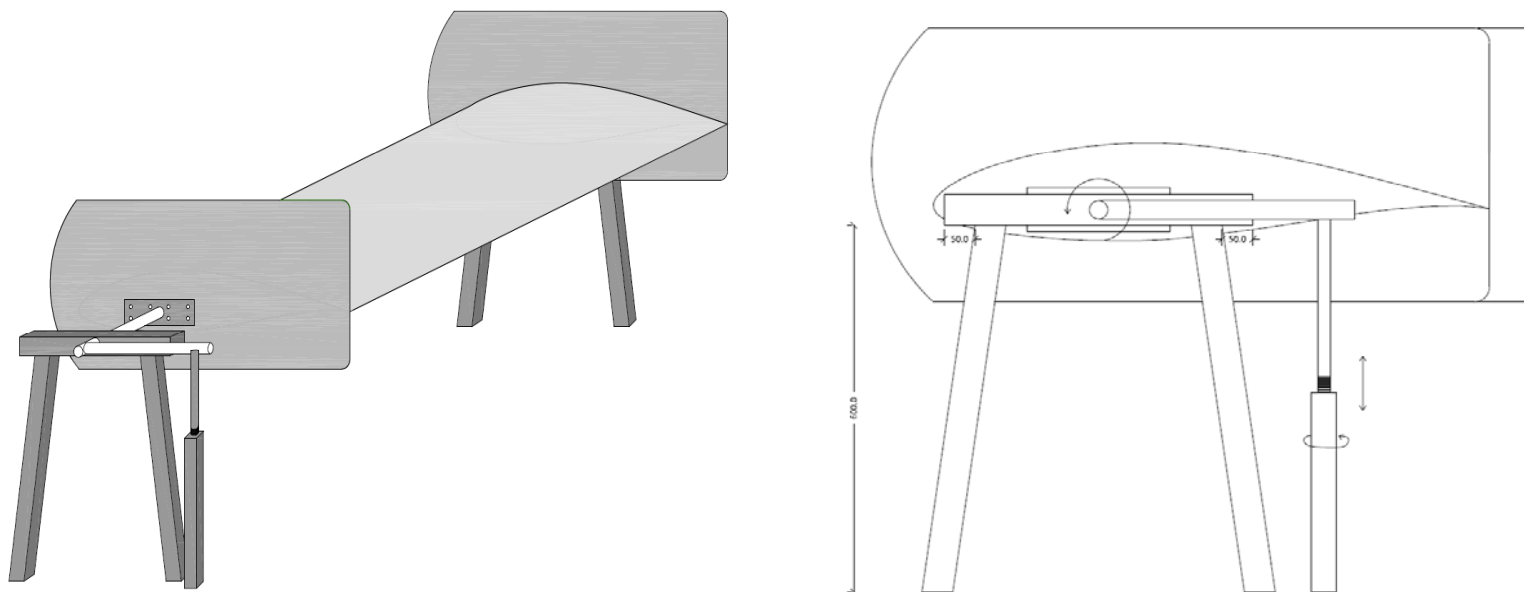
- Climatic wind tunnel – FORCE Technology and DTU
 - Rain, ice, snow



[Picture: http://www.cesdyn.byg.dtu.dk/Research/Climatic_Wind_Tunnel.aspx]

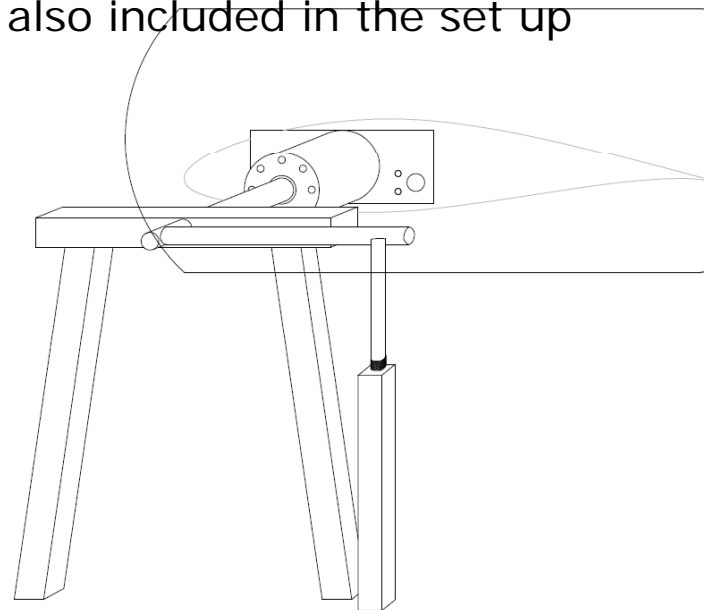
Test set-up

- NACA 64-618 airfoil section provided by LM Wind Power Blades
- 900 mm chord length and 1350 mm width

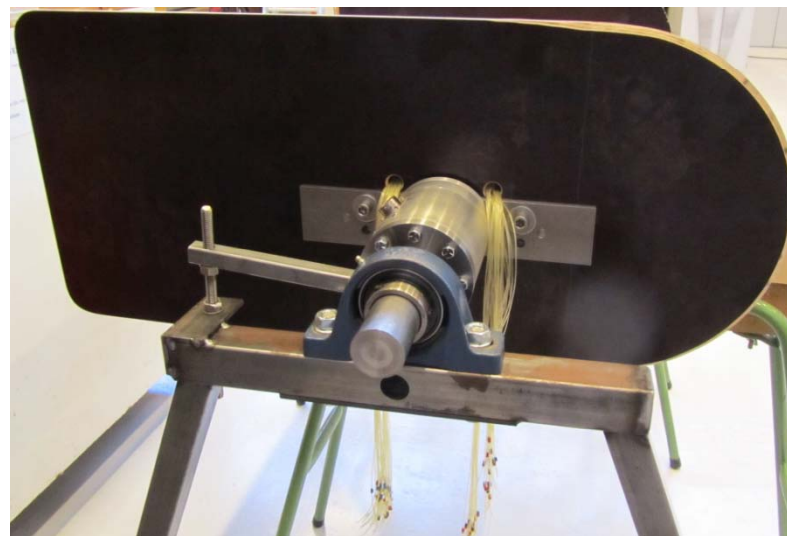


Test set-up

- NACA 64-618 airfoil section, provided by LM Wind Power Blades
- 900 mm chord length and 1350 mm width
- A pair of AMTI MC5 Force transducer is also included in the set up
- Equipped with pressure taps



Test set-up - final



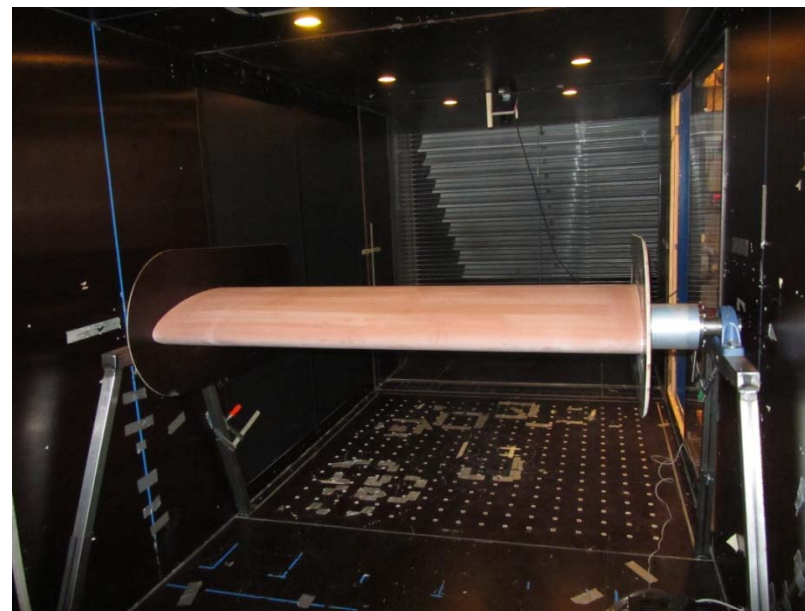
In the workshop

Test set-up - final

In the tunnel

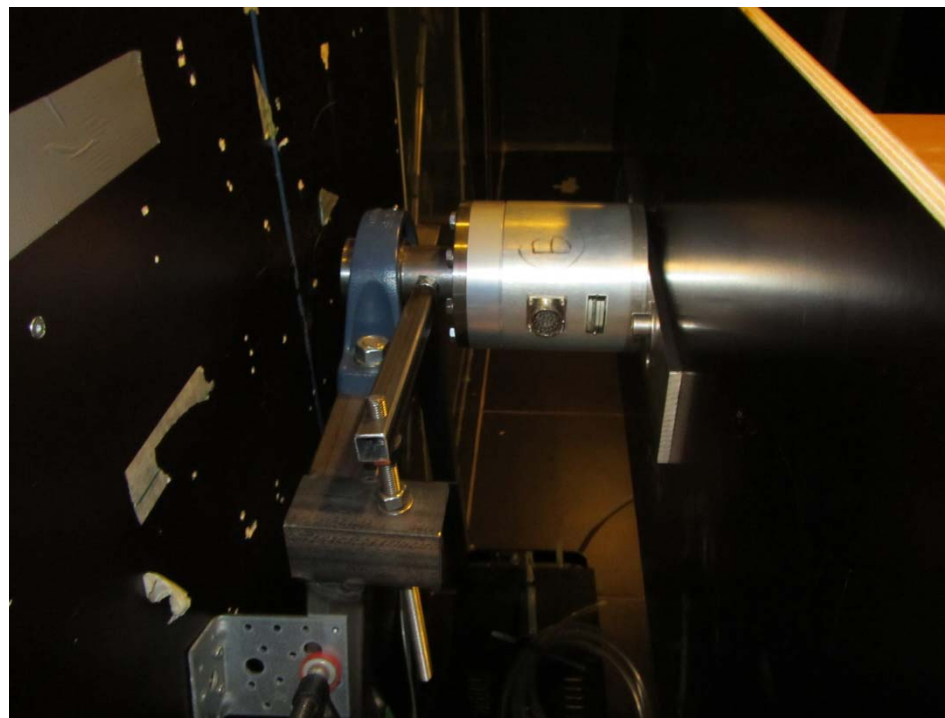


Down stream



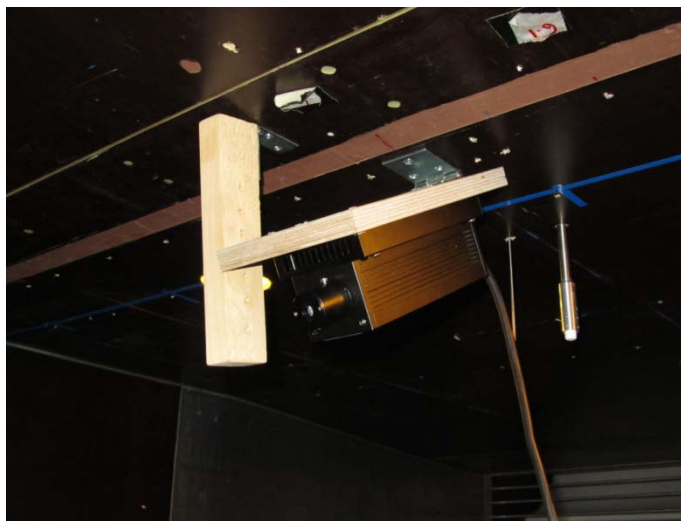
Up stream

Test set-up - final



Wind Tunnel Tests - Preparation

- Due to unexpected circumstances
 - Some velocity tests – test the set up
 - Flow visualization – with oil based smoke generator and laser



Wind Tunnel Tests – Flow Visualization



Wind Tunnel Tests – Flow Visualization



Wind Tunnel Tests – Flow Visualization



Wind Tunnel Tests – Further Plans

- Dry test:
 - Test of the set-up both aerodynamics and pressure distribution, flow visualization
- Ice test:
 - Test of ice build up with different velocity and temperature
 - Changes of aerodynamics as a function of time and amount ice
 - Flow visualization



Thank you !

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